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CROP WATCH

University of Nebraska Cooperative Extension
Institute of Agriculture and Natural Resources

No. 97-26
Dec. 12, 1997

Assessing the economic benefits of selecting and adopting new technologies

Economic factors and environmental concern will strongly influence the rate of adoption of new agricultural technology. One of the historic driving forces encouraging the adoption of new technology has been the constant need to increase the productivity and earnings of the individual farmer. The classic contribution of the Industrial Revolution was to make possible an increase in wages and living standards by providing workers with a constantly increasing amount of capital to raise their productivity. In row crop production the most vivid illustration of this principle was the shift in technology to larger, wider, faster, and more powerful farm machinery.

Biotechnology probably provides the greatest potential for environmental enhancement in the future by reducing the dependence on agrichemicals. The need for

"...new environmentally sensitive technologies must rapidly be developed and adopted, and existing technologies must be more widely used to sustain the Earth's resources. A new generation of more environmentally benign technologies are needed in energy, agriculture, manufacturing and all other sectors."

*Choosing a Sustainable Future, p. 5.
National Commission on the Environment*

chemical control of insects, disease and weeds will decline when biological control becomes both economically competitive and widely available, increasing the sustainability of the agricultural sector.

principles for variety selection remain the same, the stacked genes require a broader comparison of

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Farmer adoption of herbicide resistant varieties

Today's farmers have a wider selection of crops and crop varieties than ever before. Three factors have combined to make the process for selecting crop varieties more complex.

1. Genetically engineered varieties are now available with either one or more gene changes. For example, corn varieties resistant to both the European corn borer and Liberty herbicide were planted by many farmers this season. Next season, individual varieties will be readily available with combinations of genetically introduced genes that include resistance to more than one class of herbicide and selected insects. Although the economic

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Final Issue!

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Season reviews and field reports

Corn

It was one of those harvests where some producers had to look a little harder for the silver lining. For some of them this year, that silver lining was that at least their cattle were grazing well in the field on downed corn that had become almost impossible to harvest.

Gary Hall, Extension Educator in Phelps County: It was an extraordinary year for stalk rot and downed corn, with estimates running from 10-25 percent of yield through a broad band of central Nebraska. For some producers it was the worse situation they had ever seen. The degree of damage varied according to the variety, stress from European corn borers, drought, irrigation and limited herbicide action. In addition, corn yields were below average for many producers. Several businesses in south central Nebraska began manufacturing equipment to help pick up the downed corn.

Gary Zoubek, Extension Educator in York County: It was an awfully tough year for some parts of the county. There was poor stalk quality, heavy European corn borer damage in some areas, and pretty severe storm damage in the fall. Irrigated yields varied tremendously, from 125 to over 200 bushels per acre in irrigated corn. Overall, preliminary reports on Bt corn were pretty good.

Soybeans

Keith Glewen, Extension Educator in Saunders County: Generally producers were pleasantly surprised with soybean yields, especially considering this year's production challenges: green stem, bean leaf beetles, moisture contents at the extremes, and a long slow harvest. Some of the problems for soybean producers started early on

when, remembering recent wet springs, they planted as soon as they could get in the field. Unfortunately, that opened up the window for problems with first generation bean leaf beetles. There also was little precipitation to initiate preemergence herbicide activity. While stands may not have been what producers had hoped for, plants and yields generally compensated for early problems. Due to university and private industry research, beans grown today have greater stress tolerance and are better able to withstand the rigors of these "non-average" years. Generally, producers reported good results using Roundup Ready soybeans.

Noel Mues, Extension Educator, in Furnas County: Harvest was a long process this fall because of snow and rain in October, slow dry-down of grain, and limited storage capacity. Approximately 6 inches of rain was recorded in October and November, along with about 10 inches of snow in late October. This added much needed moisture to the soil profile, however the snow storm and high winds caused stalk lodging and breakage.

Sorghum ergot

Jim Stack, Extension Plant Pathologist, South Central REC: Sorghum producers watched the

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Lisa Brown Jasa, Editor

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Assessing the economics of change *(Continued from page 197)*

input costs when comparing options.

2. More varieties are being offered with altered product characteristics. Two examples are the high oil corn varieties for the livestock industry and the white corn for tortilla chips. As seed companies combine product characteristics with the herbicide, insect and disease resistance characteristics, economic analysis will require information about product prices and crop yields as well as a comparison of input costs.

3. Farmers are linking biotechnology products and precision farming technologies to add a new dimension to the use of genetically altered seeds. Both seeding rates and the variety planted are being altered as the planter rolls across the field, based on maps of field characteristics and guided by global positioning satellites. In these situations it is necessary to compare machine costs and altered machine practices as well as seed cost differences.

These three factors imply that economic comparison of varieties has become much more difficult. While more information may be required, the assessment process is still much as it was for a single gene change. Producers should analyze inputs — herbicide, seed, and insecticide costs — as a package and compare them to output factors such as price and yield.

Selecting a new variety

Farmers usually start variety selection by reviewing what soil, insect, disease, and weed problems exist in a particular field or part of a field. Many varieties that do not perform well under the specific conditions can be eliminated. The remaining varieties can then be compared economically, creating a group from which the most profitable ones for a particular situation can be selected. In the past, farmers compared varieties on the basis of

Bt corn and European corn borers: *Learn the how's and why's*

Rapid advent of Bt corn has generated basic questions about this new pest management tool for European corn borer, southwestern corn borer, and other caterpillars attacking corn. This 20-page color publication provides an overview of this new technology by addressing key questions:

What is Bt corn?
How is Bt corn made?
How does Bt corn work?
What is the best way to use Bt corn?
Is Bt corn worth the added cost?

The prospect of widespread use of this highly effective technology has raised concerns about European corn borer development resistance. As the title indicates, the publication also focuses on providing background information on resistance and advocates strategies to reduce this possibility. The book is edited by K.R. Ostlie, W.D. Hutchison and R.L. Hellmich, with input from over 35 entomologists, representing 20 universities, eight seed companies, the EPA, and USDA.

Concepts and key issues are illustrated with fifteen photographs, seven figures, and one table. Selective use of technical terminology is meant to introduce farmers and agricultural professionals who advise them to key terms used in the text regarding transgenic technology. A glossary provides convenient definitions of these terms.

Published by the University of Minnesota, copies are available from the University of Nebraska Cooperative Extension Publications Distribution Center. Some also may be available from your local Extension Offices. Cost is \$3.50 plus tax. To order a copy of NCR publication 602, contact:

Publications, Box 830918, University of Nebraska, Lincoln, NE 68583-0918.

yield potential, disease resistance, stalk strength, early growth, and other plant characteristics. Variety selection could be made independent of issues relative to weed or insect control. But when a farmer adopts a herbicide or insect resistant crop variety, a joint decision is made about crop and weed characteristics. In addition, seed, herbicide, and insecticide costs become part of the decision making process.

A four-step process may be useful to compare the conventional variety to a herbicide resistant variety. These steps include:

Step 1. Determine the most economically important weed problems for that field.

Step 2. Identify what chemicals most effectively control those weed species.

Step 3. Discover whether a variety is available that is resistant to the herbicide needed for the weeds in that field.

Step 4. Compare the traits of the resistant variety to the conventional variety it would replace.

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Field reports *(Continued from page 198)*

northern spread of sorghum ergot throughout 1997 but by the time the disease reached Nebraska in early October, little damage could be done to this year's crop.

On Oct. 2, ergot was found in a sorghum field near Virginia (about 12 miles east of Beatrice). It was identified in a male sterile forage sorghum that was planted specifically as a trap plot for ergot. Disease incidence (the number of plants with ergot) was very low as was disease severity (the percentage of the panicle affected). Ergot was not observed in any grain sorghums planted nearby or at any other trap plots in Gage County.

This site is the only reported occurrence of sorghum ergot in Nebraska. It is likely that the pathogen arrived in Nebraska too late to be widespread or to have any measurable impact on the grain or forage crops. The key question remains, how far north will this

pathogen overwinter? If it can overwinter in Nebraska or Kansas, it may be present early enough next season to cause measurable disease. If however, it overwinters only in southern Texas and requires dispersal up the Great Plains after sequential plantings and subsequent flowering of the sorghum crop, its impact in Nebraska may be minimal. Depending upon its dispersal characteristics, it may arrive in Nebraska too late each year to cause significant impact.

Researchers at the University of Nebraska, Kansas State University, and other cooperating institutions are addressing these issues. The goal is to develop a preliminary model to predict the survival and dispersal dynamics of the pathogen to help assess potential impact of the disease in Nebraska.

A Great Plains regional committee including representatives from Nebraska, Kansas, South Dakota,

Oklahoma, and Texas was formed to monitor the occurrence and impact of sorghum ergot in the United States as well as to coordinate research and extension activities in sorghum producing states. A cooperative effort will ensure the rapid development of an effective management plan for this disease. In June 1998, a US Sorghum Ergot Conference will be held in Corpus Christi, Texas to assess the progress and future needs of research progress and to facilitate communication among university, industry, and government researchers.

Sugarbeets

Eric Kerr, Extension Plant Pathologist, Panhandle REC:
Cercospora leaf spot of sugar beet was more widespread and severe in 1997 in the western Nebraska

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Assessing the economics of change *(Continued from page 197)*

The most important trait is yield; but other traits such as drought resistance, rate of drydown, and others may be important for a particular situation. Several changes in production practices may occur with the adoption of the new resistant varieties. The chemical used for weed control or the application time may change. Insect resistant varieties may permit the elimination of insecticides.

Tillage practices also may need to be adjusted. Better weed control due to herbicide resistant varieties may reduce row crop cultivation. There also may be a change in the crop rotation. If weeds and insects can be controlled more effectively with resistant varieties, it may be possible to change to more profitable rotations. In each of these situations, the amount of labor and machinery required for crop production changes; these changes also should be considered.

Costs of change

Careful economic analysis is required of the changes that occur in a shift from a conventional variety to a herbicide resistant variety. An eight-point check list can help you consider all potential economic impacts:

1. What is the difference in seed cost between the conventional and resistant variety?
2. Does the chemical cost per acre increase, decrease or remain the same?
3. Is there a change in crop yield and therefore revenue?
4. What machine costs change due to a new herbicide application system or elimination of insecticide applications?
5. How do the labor costs or timing of labor needs change?
6. Do the costs of tillage or cultivation practices decline?
7. Are there economic impacts due to changes in crop rotation?

8. Is overall risk in the farm operation affected?

Although improved weed control is the major purpose of the new resistant varieties, the important environmental side effect is the opportunity to shift from a less environmentally friendly herbicide to a more environmentally friendly herbicide and the opportunity to eliminate insecticide applications. The new herbicide-resistant and insect-resistant seed seem to have the potential to provide improved farm profits and improved environmental conditions in the agricultural sector. The challenge facing agriculture as it moves into the 21st Century is to develop and adopt new sustainable technologies that are economically acceptable and will enhance the environment.

William Miller
Extension Economist

Farm-saved seed likely to be damaged

Soybean producers who routinely save crop seed for planting the next season should be cautious this year.

Of all the seed used for agricultural production, the soybean seed is the most susceptible to physical damage. Its reproductive parts are on the outside of the seed and are not well protected from environmental stresses and handling during harvest. This year soybeans were often harvested when seeds were at one of two extremes — very dry or very wet. Some soybeans were harvested at as little as 7 percent moisture and were extremely vulnerable to cracking and seed coat damage while others were harvested at high moisture levels. Little quality is expected from those seeds harvested after the October snow. After several freeze/thaw cycles, seed vigor and viability suffer.

A soybean's seed coat controls how the new seed absorbs water. When the seed coat is damaged from excessive drying or improper handling, the seed is less able to control the rate of absorption. In addition, dry seeds are less flexible and less able to handle being shuffled, dropped and stored. Producers can look for split seeds or seed coat damage, but the only way to really evaluate seed quality is to test for germination and the plant's ability to survive beyond initial germination. A lot of seed damage is not visible on the seed or at initial germination.

Germination tests need to be conducted by a trained analyst who knows how to look for subtle abnormalities in seedling growth. A

seedling may germinate and absorb water, but not form a proper root.

The laboratory here is already seeing higher numbers of abnormal seeds than usual. A 10% decrease in germination can make a big difference in yield.

If you are planning to save seed from this year's crop for planting next spring, be sure to have it tested by an official laboratory, such as the Nebraska State Seed Laboratory in Lincoln. Local Extension offices can

provide assistance in submitting samples. Some commercial laboratories also can test seed. Be sure they are properly qualified and have a registered analyst on staff. Do not rely solely on home tests. They can serve as a preliminary indicator of seed quality, but registered technicians are qualified to look for subtle abnormalities that can significantly affect yields later.

**Roger Hammons, Manager
Nebraska Crop Improvement Assn**

Lab recommends testing to assess seed quality

Dave Svik, Supervisor of the Nebraska Department of Agriculture Seed Laboratory, recommends that if growers plan to use saved seed, they have it tested now and in the spring. Fall testing of 1997 seed is showing germination levels at about 89% and stress levels in the 70's.

Svik suggests getting a germination test now so that if there is a serious problem, other arrangements can be made for seed. If producers plan to use the seed, he suggests that they get a second germination test and a stress or cold test in the spring, depending on predicted planting date. He also cautioned producers against waiting too long to submit samples — usually February to early March is best — because a backlog develops.

For more information about testing procedures, rates, or how to submit samples, contact David Svik at the Nebraska State Seed Laboratory at 471-2176 or Email him at: Davidfs@agr.state.ne.us. Your local Extension educator should also have information on submitting samples.

Roundup Ready seed protected

Soybean producers should also remember that they can't save seed from Roundup Ready soybeans. This seed is patent-protected and cannot be saved for sale or replanting, regardless of whether an agreement was signed at the time of sale.

The protection and patent rights allow companies to recoup their expenses for biotechnology product research and development.

If you have questions concerning how the patent protection applies to seed you're preparing to buy, contact your local seed dealer or visit the Monsanto Web Page at www.RoundupReady.com. Penalties can be serious for those infringing on patent rights.

And the winner is ...

Congratulations to Terry Wendell of Grant who won the drawing for a one-year subscription to *Crop Watch*. Entries were collected at the recent Crop Pest Management Update meeting in Kearney.

Winter Extension meetings

Irrigation Short Course

Improve your irrigation management skills and benefit from recent irrigation research by attending the 1998 Central Plains Irrigation Short Course. It will be held Feb. 17-18 at the Camino Inn in North Platte.

On Tuesday, Feb. 17, registration will begin at 10 a.m. with sessions continuing until 6 p.m. On Wednesday, exhibits will open at 7:30 a.m. and sessions will continue until 4 p.m. Each day two groups of concurrent sessions will be held, followed by general session meetings on Nebraska Water Policy Issues (Tuesday) and New Products in Irrigation (Wednesday). Researchers and Extension specialists from the University of Nebraska, producers, and representatives of private business will present sessions. Cost for the two-day session is \$35.

Concurrent session topics include: irrigation efficiency, subsurface drip irrigation, water and nitrogen management, sprinkler devices, water management developments, conversion from furrow to sprinklers, irrigation scheduling, Republican River water policy,

For more information or to register, contact Dean Yonts, Extension Irrigation Engineer, (308) 632-1246 at the Panhandle Research and Extension Center.

South Panhandle I (Cheyenne, Deuel, Garden, Kimball, and Banner counties) is hosting the following meetings:

The National Sunflower Growers Association Meeting will be held 8:30 a.m. to 3 p.m. Jan. 6 at the Holiday Inn in Sidney.

An Irrigation Management Workshop will be held 10 a.m. to 2 p.m. MT Feb. 19 at the Security Bank in Sidney.

A Nitrogen and Irrigation

Management Meeting will be held 9 a.m. to 3 p.m. MT Feb. 27 at the Holiday Restaurant in Kimball.

For more information about any of these meetings, contact the Cheyenne County Extension Office at (308) 254-4455.

Midland IV EPU Private Pesticide Applicator Training (Boone, Nance, Colfax, and Platte counties)

Jan. 20, 9:30 a.m., Ag Park Club Room, Columbus

Jan. 21, 9:30 a.m., Ag Park Club Room, Columbus

Jan. 27, 7 p.m., KC Hall, Albion

Jan. 29, 1 p.m., VFW Hall, Schuyler

Jan. 30, 1 p.m., Senior Cen., Genoa

Feb. 2, 1 p.m., Cedar Valley Coop, Cedar Rapids

Feb. 10, 7 p.m., First National Bank, Fullerton

Feb. 11, 1 p.m., City Hall, Clarkson

Feb. 12, 1 p.m., City Hall, Humphrey

Feb. 18, 1 p.m., Town Hall, Lindsay

Feb. 19, 1 p.m., Tri Valley Coop, St. Edward

Feb. 23, 1 p.m., Legion Club, Petersburg

March 5, 7 p.m., Western Cafe, Schuyler

March 12, 7 p.m., Courthouse, Columbus

Crop Management Winter Workshops Offered

The University of Nebraska Cooperative Extension will sponsor 13 intensive workshops to provide in-depth education on a variety of topics pertinent to soil and water quality, crop production, and pest management. Taught by Extension specialists, educators and research scientists, the Crop Management Winter Curriculum workshops provide in-depth training on specific topics for agricultural professionals. Following is the more detailed information on this year's classes. (See *Crop Watch* 97-25 for general information on the workshops.)

Participants should carefully note program locations. For more information and to register, call the ARDC at 402-624-8030.

Jan. 28-29, Managing Irrigation Systems; College Park, Grand Island, 1-4 p.m. Jan. 28 and 9 a.m. to 4 p.m. Jan. 29. (Two-day workshop; nine hours), \$100. Addresses: relationship between soil type and nitrate leaching; irrigation scheduling; water meters and sprinkler and furrow irrigation; polyacrylmeide, (PAM) and subsurface drip irrigation, (SDI).

Feb. 10, Transgenic and Plant Breeding Techniques; ARDC, near Mead - \$65. What is a gene and how does it work? What techniques are used to develop genetically engineered crops? Other sources of genetic variability. Principles of developing self- and cross-pollinated crops.

Feb. 12, More Information — More Control. A Workshop to Help You Understand Precision Agriculture; ARDC, near Mead - \$109. *Introductory.* Participants will examine yield maps and other information from an actual farm and see what types of information can be obtained with GPS/GIS technology. This workshop is for farmers, consultants and dealers who want to understand the potential and limitations of site specific management. Course size limited to 30.

Feb. 13, Introduction to Farm-Level Mapping with GIS/GPS Technology; ARDC, near Mead - \$65. Hands-on, individualized training on how to set up a photographic base map.

Learn how to resolve coordinate system and topographical problems and manipulations needed to get an aerial photograph into a farm GIS. Software training. How soil sampling, variable rate fertilizer application and yield monitor can be organized in a farm level mapping

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Field reports

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Panhandle than we have seen in over a decade.

The great inoculum carryover of *Cercospora beticola* will provide the means of another epiphytotic of leaf spot in 1998 if late July, August, and September have several episodes of long periods of leaf wetness and warm nighttime temperatures.

In those fields with a history of the disease it will be important to select a variety with a high level of resistance. Fungicides may be essential, especially in susceptible varieties. Growers should monitor their crop closely for leaf spot symptoms and apply fungicides immediately after weather conditions are favorable for infection.

Winter Extension meetings

(Continued from page 203)

package. Participants will receive CD-ROM with digital farm photographs, topographic data and GIS software for viewing the farm. Course size limited to 18.

Feb. 17, Managing Alfalfa for Quality and Profit; ARDC, near Mead, \$65. Addresses all aspects of alfalfa production, including insect, weed, disease and fertilizer management; cutting schedules for optimal quality, quantity and stand viability; and water management/irrigation.

Feb. 18, Assessing Soil Quality; ARDC, near Mead, \$65. Soil properties, soil chemistry and physics. Diagnosing and finding solutions to problem soils. This workshop will provide tools and approaches for monitoring soil quality and sustainable crop production. Hands-on activities.

Feb. 19, Using Organic and Inorganic Fertilizers in Nebraska Crops; ARDC, near Mead, \$65. Nutrients used by plants: functions and effects of the essential elements. Understanding nutrient uptake by plants. Fertilizer sources, including manures, sewage sludges and inorganic fertilizers.

Feb. 24, Herbicide Mode of Action; College Park, Grand Island, \$65. Herbicide absorption, translocation, metabolism, and site of action in plants. Why herbicides kill weeds and not crops. Site of herbicide action as a basis for weed resistance.

Feb. 25, Weed Biology and Ecology, College Park, Grand Island, \$65. How weeds compete with each other and crops for nutrients and sunlight. Weed population persistence and shift in response to management practices. Processes and mechanisms involved in crop responses will be examined.

Feb. 26, Herbicide Mode of Action; ARDC, near Mead - \$65. Herbicide absorption, translocation, metabolism, and site of action in plants. Why herbicides kill weeds

and not crops. Site of herbicide action as a basis for weed resistance.

Feb. 27, Field Scout Training; ARDC, near Mead - \$25. Identification and economic thresholds of insect pests in corn and soybeans. Weed management and crop disease identification. Fertility deficiency symptoms. Growth and development of corn and soybeans.

March 3, Transgenic and Plant Breeding Techniques; College Park, Grand Island - \$65. What is a gene and how does it work? What techniques are used to develop genetically engineered crops? How transgenic crops are developed and how are they different from other plants. Other sources of genetic variability. Principles of developing self and cross pollinated crops.

March 5, Advanced Row Crop Sprayer School; ARDC, near Mead, \$45. How can you get a quality spray application? Which nozzles are best for specific situations? Nozzle types, spacing and angles will be discussed and demonstrated. Factors affecting coverage and drift, including particle sizes, pump pressure and wind. Demonstration on drift. Problem situations and solutions.

March 12, Effect of Stress on Physiology of Crops; ARDC, Near Mead, \$65. Participants will acquire a better understanding of how stress factors such as soil pH, moisture, temperature, and nutrient deficiencies impact the growth, development and eventual yield of corn and soybeans.

March 25, Crop Disease Basics: Fungal and Nematode Pathogens; UNL, East Campus, \$65. Principles of plant disease diagnostics. Detailed life cycles, identification and microscope exam of fungal pathogens and nematodes. Implications for the future; transgenic plants as a source of resistance. Class size limited to 30. Register by March 6.

Southern Nebraska: Get ready for more snow

This year's El Nino weather pattern is projected to be as strong as or stronger than the record event of 1983. Storm systems on the west coast of the United States will be stronger than previous El Nino events and continue throughout the winter.

Above normal precipitation has fallen over Texas, Oklahoma, eastern Kansas, and southern Nebraska since late October. Heavy precipitation over southern Nebraska has helped replace severely depleted soil moisture reserves across the southern third of the state. If long lead forecasts are correct, it is highly likely that moisture reserves will be near capacity by next May.

Moisture doesn't appear to be a limiting factor for next year's wheat in the southern United States. Below normal precipitation across Montana, North Dakota, and South Dakota could negatively impact spring wheat as soil moisture replenishment has been minimal.

Of course, winter hardiness will be a major concern next spring. Areas north of Nebraska are projected to receive below normal snowfall, making winter wheat vulnerable to arctic air intrusions. An increase in the number of storms entering the west coast should cause rapid temperature swings throughout the winter across the southern and central plains. Kansas and Nebraska may

have more freeze-thaw cycles than normal.

During the last two months, a sharp precipitation gradient has formed across the central plains. Southern Nebraska has received above normal precipitation, while the Dakota's have received much below normal precipitation. This pattern is in line with long range weather projections put out by the National Climate Prediction Center and is expected to continue through March.

Total snowfall this winter across southern Nebraska is virtually guaranteed to be above the long-term average. Much of southern Nebraska received almost half of its average seasonal snowfall by late October. Since the beginning of September,

strong storm systems have affected Nebraska every 14-21 days and this trend is expected to continue.

Southern Nebraska has the greatest likelihood of receiving above normal snowfall this winter. Northern Nebraska should receive normal to below normal snowfall, with the greatest probability of below normal snowfall confined to the northern most areas.

If snowfall is above average, flooding could be a problem this spring. Research conducted at the University of Oklahoma suggests Nebraska is likely to receive heavy precipitation in March.

Al Dutcher
State Climatologist
Agricultural Meteorology

Regent okayed for field corn

Regent 80WG (fipronil) insecticide (Rhone-Poulenc) has received EPA approval for use as a planting time infurrow application on field corn. This insecticide is based on a new chemistry and is labeled for control of corn rootworms, first generation European corn borer, and several other early season pests (wireworms, grubs, seedcorn maggots, seedcorn beetles, billbugs, chinch bugs, common stalk borer

and thrips).

Apply Regent 80WG at a rate of 0.149 oz/1000 row ft. Do not apply more than 2.6 oz Regent 80WG per acre. Do not apply to sweet corn or popcorn. See label for additional restrictions and use information. Regent 80WG is a restricted use pesticide due to toxicity to estuarine invertebrates and birds.

Bob Wright, Extension
Entomologist, South Central REC

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